

**Citation:**

Aiello AE, Coulborn RM, Perez V, Larson EL. Effect of hand hygiene on infectious disease risk in the community setting: a meta-analysis. *Am J Public Health*. 2008 Aug;98(8):1372-81. Epub 2008 Jun 12.

**PubMed ID:** [18556606](#)

**Study Design:**

Meta-Analysis

**Class:**

M - [Click here](#) for explanation of classification scheme.

**Research Design and Implementation Rating:**

POSITIVE: See Research Design and Implementation Criteria Checklist below.

**Research Purpose:**

- To quantify the effect of hand-hygiene interventions on rates of gastrointestinal and respiratory illnesses
- To identify specific interventions with the most potential for reducing symptoms of gastrointestinal and respiratory illnesses

**Inclusion Criteria:**

- Hand hygiene trials published from January 1960 to May 2007
- Published in any language
- Outcome of a reported or diagnosed gastrointestinal illness (such as shigellosis), a reported or diagnosed respiratory illness (such as influenza), a combination of general gastrointestinal or respiratory symptoms of infection (such as diarrhea or runny nose), or gastrointestinal or respiratory infectious symptom-related absences (such as school absence for a "cold")
- Independent variable was a hand-hygiene intervention, such as hand-hygiene education, soap-use intervention (nonantibacterial or antibacterial soap), or waterless hand sanitizer
- Articles were restricted to intervention trials conducted in the community and employing a randomized or quasi-experimental study design

**Exclusion Criteria:**

- Hand-hygiene interventions that were implemented as part of a major public health infrastructure or systems improvement project, such as municipal water supply and waste disposal
- Setting was healthcare facility or specialized setting, such as military
- Articles that did not provide an effect estimate such as a rate ratio, odds ratio, etc.
- Articles that did not provide enough data to allow calculation of a rate ratio

## Description of Study Protocol:

### Recruitment

Articles were identified from the search of four electronic databases: PubMed (1960 - 2007), Scopus for EMBASE (1974 - 1980), Science Citation Index (Web of Science; 1960 - 2007), and Cochrane Library (1988 - 2007), using 241 keyword combinations. Reference lists were also searched for additional related articles, and a manual search was performed with the author's reference database.

**Design:** Meta-Analysis

**Blinding used (if applicable):** not applicable

**Intervention (if applicable):**

Two authors independently evaluated selected studies.

### Statistical Analysis

- Publication bias was assessed graphically with funnel plots, the Begg and Mazumdar rank correlation and the Egger test
- Meta-analyses conducted using random effects models
- Forest plots were generated with a mixed-modeling procedure
- To assess statistical heterogeneity, Cochran Q-statistic and the  $I^2$  statistic were calculate for each pooled estimate
- To assess potential sources of heterogeneity, multilevel random effects models were used
- To calculate the preventive fraction for exposure, the rate ratios and corresponding confidence intervals were used

## Data Collection Summary:

### Timing of Measurements

Not applicable.

### Dependent Variables

- Gastrointestinal and respiratory infectious illnesses: reported or diagnosed gastrointestinal illness (such as shigellosis), a reported or diagnosed respiratory illness (such as influenza), a combination of general gastrointestinal or respiratory symptoms of infection (such as diarrhea or runny nose), or gastrointestinal or respiratory infectious symptom-related absences (such as school absence for a "cold"), grouped by specific outcome into three possible categories

### Independent Variables

- Hand hygiene interventions: hand-hygiene education, soap-use intervention (nonantibacterial or antibacterial soap), or waterless hand sanitizer, grouped by specific intervention into seven possible categories

### Control Variables

## Description of Actual Data Sample:

**Initial N:** 5,378 articles in initial keyword search. 718 were initially reviewed by abstract or full article. 602 studies were retrieved for detailed assessment.

**Attrition (final N):** 30 studies included in the meta-analysis. 572 articles were excluded on basis of review criteria.

**Age:** not applicable

**Ethnicity:** not applicable

**Other relevant demographics:**

**Anthropometrics**

**Location:** International studies

## Summary of Results:

### Key Findings:

- Improvements in hand hygiene resulted in reductions in gastrointestinal illness of 31% (overall RR = 0.69, 95% confidence interval: 0.58, 0.81) and reductions in respiratory illness of 21% (overall RR = 0.79, 95% confidence interval: 0.66, 0.95).
- The most beneficial intervention was hand-hygiene education with use of nonantibacterial soap (RR = 0.61, 95% confidence interval: 0.43, 0.88).
- Hand-hygiene education showed a strong protective effect against gastrointestinal illnesses (RR = 0.69, 95% confidence interval: 0.50, 0.95).
- The pooled RR for the use of alcohol-based hand sanitizer with hand-hygiene education showed a significant reduction in combined illnesses (RR = 0.79, 95% confidence interval: 0.67, 0.93).
- The pooled RR for the use of alcohol-based hand sanitizer alone showed a significant reduction in combined illness outcomes, as did the pooled RR for using benzalkonium chloride-based hand sanitizer.
- Use of antibacterial soap showed little added benefit compared with use of nonantibacterial soap.

### Rate Ratios and 95% Confidence Intervals for the Association Between Specific Hand-Hygiene Interventions and Each Illness Outcome

Interventions	Gastrointestinal Illness (n = 24)	Respiratory Illness (n = 16)	Combined Illnesses (n = 10)
Education vs control	0.69 (0.50, 0.95)	0.86 (0.73, 1.00)	---
Nonantibacterial soap with education vs control	0.61 (0.43, 0.88)	0.49 (0.40, 0.61)	0.94 (0.74, 1.18)
Antibacterial soap with education vs control	0.59 (0.33, 1.06)	0.50 (0.40, 0.61)	---

Antibacterial soap vs nonantibacterial soap	0.99 (0.54, 1.83)	1.00 (0.84, 1.19)	0.96 (0.71, 1.30)
Alcohol-based hand sanitizer vs control	---	---	0.74 (0.59, 0.93)
Alcohol-based hand sanitizer with education vs control	0.77 (0.52, 1.13)	0.93 (0.84, 1.03)	0.79 (0.67, 0.93)
Benzalkonium chloride-based hand sanitizer vs control	0.58 (0.30, 1.12)	0.60 (0.45, 0.81)	0.59 (0.45, 0.78)

### Other Findings

- A greater proportion of hand-hygiene intervention studies were conducted in developed than in lesser developed countries
- Sources of heterogeneity were not statistically significant for either gastrointestinal or respiratory outcomes

### Author Conclusion:

The results of our meta-analyses provide the needed data synthesis for formulating consistent community-based hand-hygiene guidelines. First, we confirmed that hand-hygiene interventions are efficacious for preventing gastrointestinal illnesses, in both developed and lesser-developed countries. However, the overall impact of hand hygiene was less efficacious for respiratory illnesses. Overall, there was little evidence for an additional impact of new products, such as alcohol-based hand sanitizers or antibacterial soaps compared with nonantibacterial soaps, for reducing either gastrointestinal or respiratory infectious illness symptoms. Last, there is a need to include microbiological assessments of the agents that may be associated with clinical symptoms of infection so that agent-specific targeted hand-hygiene practices can be evaluated.

### Reviewer Comments:

*Authors note that very few studies in the review rigorously assessed hand-hygiene practices during the intervention period or monitored the use of products. Authors note the following limitations:*

- *In some cases, classification of the intervention was unclear due to multiple components*
- *For some interventions, only single studies were available, so pooled estimates could not be generated*
- *Heterogeneity was significant in pooled estimates across all studies*
- *Evidence of publication bias for gastrointestinal illness outcomes, therefore, the pooled estimated generated may be exaggerated for this outcome*

### Research Design and Implementation Criteria Checklist: Review Articles

#### Relevance Questions

1. Will the answer if true, have a direct bearing on the health of patients?

Yes

2.	Is the outcome or topic something that patients/clients/population groups would care about?	Yes
3.	Is the problem addressed in the review one that is relevant to nutrition or dietetics practice?	Yes
4.	Will the information, if true, require a change in practice?	Yes

### Validity Questions

1.	Was the question for the review clearly focused and appropriate?	Yes
2.	Was the search strategy used to locate relevant studies comprehensive? Were the databases searched and the search terms used described?	Yes
3.	Were explicit methods used to select studies to include in the review? Were inclusion/exclusion criteria specified and appropriate? Were selection methods unbiased?	Yes
4.	Was there an appraisal of the quality and validity of studies included in the review? Were appraisal methods specified, appropriate, and reproducible?	Yes
5.	Were specific treatments/interventions/exposures described? Were treatments similar enough to be combined?	???
6.	Was the outcome of interest clearly indicated? Were other potential harms and benefits considered?	Yes
7.	Were processes for data abstraction, synthesis, and analysis described? Were they applied consistently across studies and groups? Was there appropriate use of qualitative and/or quantitative synthesis? Was variation in findings among studies analyzed? Were heterogeneity issues considered? If data from studies were aggregated for meta-analysis, was the procedure described?	Yes
8.	Are the results clearly presented in narrative and/or quantitative terms? If summary statistics are used, are levels of significance and/or confidence intervals included?	Yes
9.	Are conclusions supported by results with biases and limitations taken into consideration? Are limitations of the review identified and discussed?	Yes
10.	Was bias due to the review's funding or sponsorship unlikely?	Yes

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